

Appl. No. 10/635,489
Amendment dated: June 20, 2005
Reply to OA of: February 18, 2005

REMARKS

Reconsideration of the present patent application is respectfully requested in view of the amendments to the claims and following remarks. Applicants have canceled claim 7 from the application and amended claim 1 to more specifically define the invention. The amendment to claim 1 is fully supported by Applicants' specification as originally filed and as would be appreciated by one of ordinary skill in the art to which the invention pertains. The buffer layer is specifically referred to on page 5, line 16. Claim 2 has been amended to provide that a mixture of inert gases may be used as fully supported by Applicants' specification at page 4, line 15. Applicants most respectfully submit that all of the claims now present in the application are in full compliance with 35 USC 112 and are clearly patentable over the references of record.

I. Response to Rejections Under 35 U.S.C. § 112

The Examiner indicates that claim 7 of the present patent application is rejected under 35 U.S.C. § 112, first paragraph, as failing to comply with the enablement requirement. The claim contains subject matter which was not described in the specification in such a way as to enable one skilled in the art to which it pertains, or with which it is most nearly connected, to make and/or use the invention. Claim 7 recites "inert gas atom is doped by dry etching". How can doping be done by etching?

Response:

Applicants have canceled claim 7 without prejudice or disclaimer.

II. Response to Rejections Under 35 U.S.C. § 102

The Examiner indicates that claims 1-6 and 8-10 of the present patent application are rejected under 35 U.S.C. § 102(e) as being anticipated by the USP 6,812,081 (Yamazaki et al.).

Applicants wish to direct the Examiner's attention to MPEP § 2131 which states that to anticipate a claim, the reference must teach every element of the claim.

Appl. No. 10/635,489
Amendment dated: June 20, 2005
Reply to OA of: February 18, 2005

"A claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference." *Verdegaal Bros. v. Union Oil Co. of California*, 814 F.2d 628, 631, 2 USPQ2d 1051, 1053 (Fed. Cir. 1987). "The identical invention must be shown in as complete detail as is contained in the ... claim." *Richardson v. Suzuki Motor Co.*, 868 F.2d 1226, 1236, 9 USPQ2d 1913, 1920 (Fed Cir. 1989). The elements must be arranged as required by the claim, but this is not an *ipsissimis verbis* test, i.e., identity of terminology is not required. *In re Bond*, 910 F.2d 831, 15 USPQ2d 1566 (Fed.Cir. 1990).

Response:

Applicants respectfully indicate that the method for transforming an amorphous silicon layer into a polysilicon layer is different from that of the cited reference (Yamazaki et al.). The difference is as follows:

The crystallization of the first semiconductor film having an amorphous structure of the cited reference (Yamazaki et al.) is characterized in that a metallic element for promoting crystallization of silicon is introduced on the surface of the first semiconductor film having the amorphous structure, as described in column 2, lines 10 to 15 of the specification thereof. This crystallization process is so-called "Metal Induce Crystallization" (MIC). After the formation of the metal element, the first semiconductor film having the amorphous structure is heated and irradiated by a laser light thereto for crystallization to form the first semiconductor film having the crystalline structure. The "noble gas" element inside the first semiconductor film having the crystalline structure is removed or reduced by the laser light irradiation.

Therefore, the crystallization of the first semiconductor film having an amorphous structure of the cited reference is achieved only by the heating treatment, not by the laser light irradiation, and the laser light irradiation is performed after the "heating treatment as would be appreciated by one of ordinary skill in the art to which the invention pertains. The laser light irradiation is used to reduce the concentration of the inert gas element after the crystallization of the first semiconductor film is completed.

Appl. No. 10/635,489

Amendment dated: June 20, 2005
Reply to OA of: February 18, 2005

On the other hand, the crystallization of the amorphous silicon layer of the presently claimed invention is achieved by the excimer laser annealing (ELA) process, as described in lines 9 to 11, page 5 of the specification thereof. The excimer laser scans the surface of the amorphous silicon substrate with 95% overlapped scanning ratio and continuous laser pulses having the duration of 30 ns per pulse. The inert gas (noble gas) doped before the ELA process is to normalize the dimension of the crystallized silicon crystal and improve the orientation of the silicon crystals during the transformation of the amorphous silicon layer into the polysilicon layer. As a result, the excimer laser used for the ELA process of the present patent application is not for reducing the doping concentration of the noble gas inside the polysilicon layer and it is used in different ways comparing with the laser of the cited reference.

As described in the specification of the present patent application, no "additional" heating treatment is needed after the ELA process for the transformation of the amorphous silicon layer of the present patent application. Therefore, the transformation of the amorphous silicon layer into the polysilicon layer is simple and less-energy-consumed than the method of manufacturing a semiconductor device of the cited reference (Yamazaki et al.).

Besides, no "additional" metallic element is needed for the crystallization of the amorphous silicon layer of the present patent application, wherein the metallic element is required for the MIC process of the cited reference and causes the undesired current leakage of the semiconductor structure of the cited reference. Therefore, an additional "gettering structure" is needed to reduce the current leakage of the semiconductor structure of the cited reference, as described in column 3, lines 49 to 54 of the specification thereof. That is, a "second semiconductor film including a noble gas element" formed on the first semiconductor film for removing or reducing the metallic element in the first semiconductor film having the crystalline structure. After the gettering process is completed, a "removing process" is needed for removing the "second semiconductor film" from the surface of the first semiconductor film having the crystalline structure.

Appl. No. 10/635,489
Amendment dated: June 20, 2005
Reply to OA of: February 18, 2005

Since no metallic element is needed for the crystallization of the amorphous silicon layer of the present patent application, the additional "second semiconductor film including a noble gas element" and the additional "removing process" thereof is not needed in the method for transforming an amorphous silicon layer into a polysilicon layer of the present patent application. As a result, a plenty of material (e.g. silicon and the inert gas therein) and the time for the additional process can be saved. The yield for the method to transform an amorphous silicon layer into a polysilicon layer will thus increase.

As described above, the method for transforming an amorphous silicon layer into a polysilicon layer of the presently claimed invention is definitely different from the method of manufacturing semiconductor device of the cited reference. The reasons are as follows:

1. The primary object of the laser irradiation of the cited reference (Yamazaki et al.) is to suppress the existence of the distortion during the crystallization of the semiconductor film, not to "transform" the first semiconductor film having an amorphous structure into the first semiconductor film having the crystalline structure.

2. No additional heating treatment, metallic element, and gettering structure are needed for the method of the present patent application. The transformation method of the present patent application is simpler, less energy-consumed and more time-saved than the method of manufacturing a semiconductor device of the cited reference (Yamazaki et al.).

3. After the amendment to claim 1 of the present patent application, the scope of the present patent application is more clarified and is different from that of the cited reference (Yamazaki et al.).

Therefore, claim 1 of the present patent application is not anticipated by the cited reference (Yamazaki et al.) as indicated by the examiner. Regarding claims 2 to 6 and 8 to 10 of the present patent application, the dependent claims of the claim 1, they are not anticipated by cited reference because the claim 1 of the present patent application is not anticipated by cited reference.

Appl. No. 10/635,489
Amendment dated: June 20, 2005
Reply to OA of: February 18, 2005

As a result, claims 1-6 and 8-10 of the present patent application are not anticipated by the Yamazaki et al. reference. Applicants respectfully traverse the rejections and most respectfully request that the rejection be withdrawn.

CONCLUSION

In view of the foregoing remarks, reconsideration and allowance of the application are now believed to be in order, and such action is hereby solicited. If any points remain in issue that the Examiner feels may be best resolved through a personal or telephone interview, the Examiner is kindly requested to contact the undersigned attorney at the telephone number listed below.

Respectfully submitted,

BACON & THOMAS, PLLC

By: 
Richard E. Fichter
Registration No. 26,382

625 Slaters Lane, 4th Fl.
Alexandria, Virginia 22314
Phone: (703) 683-0500
Facsimile: (703) 683-1080
REF:kdd
A01.wpd
June 20, 2005